

### **REMARKS**

The Office Action of June 26, 2008 has been carefully studied. The following paragraphs correspond to the order of the paragraphs of the Office Action:

#### **Information Disclosure Statement**

With respect to reference “DE 1110941”, this reference was inaccurately described inasmuch as it should have been EP 1110941 which is the counterpart to the U.S. published application 2001/000305758. The Examiner is thanked for correcting the number of the published application.

#### **Claim Objections**

The Examiner is thanked for noting that claim 7 should have provided in line 2 the expression “the reducing agent”, rather than “the reactor” and it is so corrected.

#### **Claim Objections – 35 U.S.C. 112**

Claims 12 and 13 are now amended so as to make it clear that it is a catalyst composition which is dissolved in a solvent.

#### **Claim Rejections – 35 U.S.C. §102**

Before discussing the reference, it is seen that claim 1 is amended by defining the catalyst composition as a liquid catalyst composition, and that the selective hydrogenation is directed to 1, 3-butadiene so as to result in a conversion of 1, 3-butadiene to primarily cis-2-butene. This selectivity to cis-2-butene is emphasized in new claim 24 where the selectivity to cis-2-butene is over 98% for an 80% 1,3-butadiene conversion. The values in claim 22 are supported by tables 1, 3 and 4 on pages 14 and 15 of the specification, noting that lines 10 and 13 on page 15 mentions that the selectivities were measured at a 1, 3-butadiene conversion of 80%.

Table 4 on page 15 is particularly pertinent to the non-obviousness of the present invention since it compares Applicant's invention utilizing a liquid catalyst (homogeneous catalysis) to a system using a supported catalyst (heterogeneous catalysis). By inspection, it is

seen that the selectivity to cis-2-butene for a catalyst comprising paladium supported by alumina is only 20% whereas Applicant's catalysts in examples 1, 3 and 4 of Table 4 yield selectivities of over 98%. New claim 25 is dependent on claim 24 and specifies that the catalyst comprises an iron salt and the ligand is an imino compound, as utilized in the tests on Table 4.

Inasmuch as Applicants catalyst composition is clearly a liquid composition as specified for example on page 4, lines 6 and 10 of the specification, and is highly selective to the conversion of 1, 3-butadiene to cis-2-butene, the present invention is both non-obvious and patentable over the cited references. In support of this contention, the following discussion of the references is respectfully presented for the Examiner's consideration:

**Yoo U.S. 3,917,737**

It is clear beyond question that this reference is directed to a heterogeneous catalyst inasmuch as an inorganic oxide support is an element of the catalyst (column 1, lines 13 and 14). Also see column 7, lines 24-30 where it states that an inorganic support material is contacted with a solution of the metal component, and in column 10, lines 4-6 that the acidic solid silica-based and inorganic material is used both as an effective supporting matrix and as a co-catalyst.

Aside from the difference in catalysts, it is not seen that this reference suggests the conversion of 1, 3-butadiene into cis-2-butene, much less with the unexpectedly high selectivities achieved by Applicant's invention.

**Mussmann et al., 6,040,263**

This reference discloses ionic solvents, but it is not seen that there is any disclosure or suggestion that the resultant catalyst can be used to convert 1, 3-butadiene to predominantly cis-2-butene much less with over 98% selectivity. Likewise, this reference discloses the use of a support impregnated with the catalytic composition (column 3, lines 54-56) despite the fact that the examples do not appear to use a supported catalyst.

It is also recognized from column 4, lines 35-38 that when the reaction is discontinued, the organic phase containing the reaction product can advantageously be separated by simple settling out of the polar catalytic phase containing the molten salt and the major portion of the

catalyst. The reference then states in the following sentence that the polar phase contains at least a portion of the catalyst and is at least partially returned to the reactor with the other portion being treated to eliminate the remaining catalyst. This treatment of the other portion presumably would require a separation step such as, for example distillation or solvent extraction. In contrast, a supported catalyst need only be filtered from a reaction solution and therefore constitutes a much simpler and more efficient method.

Accordingly, it is respectfully submitted that it would not be obvious to one of ordinary skill in the art to convert the heterogeneous catalyst of Yoo to a homogeneous catalyst since different activities and manipulative steps are involved. In particular, counsel respectfully challenges the statement in the Office Action that it would be obvious to convert the Yoo process by using the ionic solvent of Mussmann because it would "make the process simpler and cheaper to operate since it does not have to use fixed bed, moving bed or fluid beds". In the final analysis, as stated on page 4, lines 2-5, Applicants were interested in providing a process for the hydrogenation of 1, 3-butadiene to butenes which would have low activity for consecutive hydrogenation of 1-butene or 2-butene to butane, and as a result Applicants now provide a process with a homogeneous catalyst wherein the selectivity of 1-3-butadiene to cis-2-butene predominates or is over 98%, and this highly unexpected selectivity forms the basis of patentability of the present invention.

In view of the above remarks, favorable reconsideration is courteously requested. If, however, there are any residual issues which can be expeditiously resolved by telephone conference, the Examiner is courteously invited to telephone counsel at the number indicated below.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,

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